

REMARKS

By this Amendment the abstract has been shortened in length as required, claim 29 has been revised to include the features of claims 29, 42 and 43 (now canceled) as well as to overcome the examiner's formality criticisms, and claims 30, 31, 37-40, 46-49 and 53-55 have been amended to better conform with U.S. practice. Entry is requested.

In the outstanding Office Action the examiner has rejected claims 28-42, 45-48 and 50-56 under 35 USC 102(b) as being anticipated by Naik, and he has rejected claims 43, 44 and 49 under 35 USC 103(a) as being unpatentable over Naik "in view of official notice."

The inventors assert that these rejections cannot apply to the amended claims.

Naik discloses an internal combustion engine misfire detection method wherein misfire conditions in the cylinder are diagnosed over all operating conditions through a reference period model which calculates the components of the reference periods that are not attributed to a misfire condition. The removal of such components from the measured reference periods yields a reference period component sensitive only to misfire conditions. The magnitude, position and stability of the resulting component indicates misfire severity, location and persistence. The reference periods are determined as timed durations between adjacent reference signals, wherein the timing of the reference signals corresponds to predetermined angular positions of the crankshaft.

The following significant differences exist between NAIK and present invention:

- The present invention concerns a method for determining the operating status of an internal combustion engine and is designed to be used in the context of regulating or controlling an internal combustion engine. NAIK only describes misfire-detection.
- NAIK's invention describes a procedure to detect misfire conditions. The present invention is unable to detect misfire conditions.
- The present invention uses a computational model that calculates variables defined by the cylinder states (e.g. charge condition, mass flow, torque) from input variables defining the overall process (e.g. engine speed, input pressure, valve timing, ignition timing), wherein a prior knowledge of the result is not necessary.

NIAK determines the content of a measured duration that is due to engine misfire. Correction terms as well as the average duration of a number of previous reference periods are subtracted from the current duration and compared to tabulated threshold values.

The thresholds are calibrated for defined ranges of engine conditions and known a priori.

- The present invention uses computational models for various individual cycle parts which are based on at least partially different assumptions and different simplifications.

The computational model of NAIK for different reference periods is not based on different assumptions or different simplifications.

- The intervals defining the duration of different cycle parts in the present invention are separated by time limits which are not necessarily identical for adjacent cycles.
- The computational model of NAIK is implicitly based on identical definitions of reference times for adjacent cycles. In the present application the computational model algebraically calculates variables defining individual cycle parts in one step. NAIK doesn't disclose such calculations.
- In the present invention an operating state at the end of a cycle part is used as an initial condition for computing the next cycle part.

NAIK doesn't disclose such a step.

- In the present application each operating state is defined by at least one variable selected from a group comprising torque, mass-flow, in-cylinder charge condition of at least one cylinder, energy content and wall heat flow of at least one cylinder.
NAIK only estimates the noise and disturbance signal content in the reference periods in order to detect misfiring.

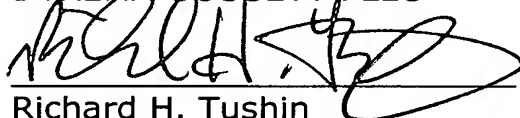
Based on the foregoing, it is clear that NAIK does not suggest the claimed invention.

Favorable reevaluation is requested.

Respectfully submitted,

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